

**42nd Annual Meeting of the International Neuropsychological Society (INS) in Seattle, Washington on February 12-15, 2014**

**Abstract:** Cognitive Function Related to Environmental Exposure to Manganese

Rosemarie M. Bowler<sup>1</sup>, Vihra Gocheva<sup>1</sup>, Erica S. Kornblith<sup>4</sup>, Cheryl Beseler<sup>3</sup>, Michelle Colledge<sup>2</sup>, Frank G. Du<sup>1</sup>, Harry A. Roels<sup>5</sup>, George Bollweg<sup>7</sup>, Danelle Lobdell<sup>6</sup>

<sup>1</sup>San Francisco State University, Department of Psychology, 1600 Holloway Ave. San Francisco, CA 94132 USA

<sup>2</sup>ATSDR, Region 5, 77 W. Jackson Blvd., MS ATSD-4J Chicago, IL 60604 USA

<sup>3</sup>Colorado State University, 1879 Campus Delivery, Fort Collins, CO USA

<sup>4</sup> California School of Professional Psychology at Alliant International University, 1 Beach St. San Francisco, CA 94133 USA

<sup>5</sup>Louvain Centre for Toxicology and Applied Pharmacology, Université catholique de Louvain, Avenue Mounier 53.02, 1200 Brussels, Belgium

<sup>6</sup>U.S. EPA, Office of Research and Development, MD 58A, Research Triangle Park, NC 27711

<sup>7</sup>U.S. EPA, Region 5 Air and Radiation Division-AT18J, 77 W. Jackson Blvd., Chicago IL 60604, USA

**Background:** Marietta and East Liverpool (EL), Ohio have been identified as having elevated manganese (Mn) in air due to industrial pollution.

**Objectives:** To evaluate relationships between distance from the Mn-air source and cognitive function of residents.

**Methods:** Cross-sectional data were obtained from an EPA-sponsored study comparing Marietta and EL. A neuropsychological test battery including Stroop Color Word Test, Animal Naming, Auditory Consonant Trigrams (ACT) and Rey-O was administered to study participants (EL=86, Marietta=100). To estimate Mn-air, U.S.EPA's AERMOD dispersion model was used. Distance from source was calculated using participants' residential address and air miles from facility emitting Mn. A binary logistic regression model controlling for annual household income examined neuropsychological outcomes as a function of distance from source.

**Results:** There were no age, sex, or employment status differences between towns. Years education was lower in EL (M=12.9) than Marietta (M=14.6) and years residency in town were higher in EL (M=47.0) than Marietta (M=36.1). EL participants resided closer to the Mn source

than Marietta (M=1.12 vs M=4.75 air miles) and Mn-air exposures were higher in EL (M=0.269  $\mu\text{g}/\text{m}^3$ ; range 0.10-23.0  $\mu\text{g}/\text{m}^3$ ) than Marietta (M=0.184  $\mu\text{g}/\text{m}^3$ ; range 0.04-0.96  $\mu\text{g}/\text{m}^3$ ). Town differences existed on tests of category fluency, immediate memory, and word reading speed; EL had lower scores. Closer distance to the Mn source significantly increased the odds of impairment ( $\leq 2^{\text{nd}}$  %) on ACT 9' [OR=1.26, 95% CI: 1.02-1.55,  $p=0.032$ ], and 18' delay [OR=1.44, 95% CI: 1.11-1.87,  $p=0.006$ ] and on Rey-O copy [OR=1.27, 95% CI: 1.01-1.61,  $p=0.043$ ].

**Conclusions:** Increased risk of impairment in delayed memory with distraction and visuospatial/executive function were related to residing closer to the Mn source. Environmental exposures are low compared to occupational exposures and small positive findings may be possible early effects of Mn.

*This abstract does not necessarily reflect EPA policy.*

Submitted to the International Neuropsychological Society Meeting, Seattle, Washington February 2014.